

JP 04-12751

Japanese Kokai Patent Application No. Hei 4[1992]-12751

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Code: 1505-32534

## JAPANESE PATENT OFFICE

## PATENT JOURNAL

KOKAI PATENT APPLICATION NO. HEI 4[1992]-12751

Int. Cl. <sup>5</sup> :	A 61 F 13/15 13/54 A 61 F 13/18 A 41 B 13/02
Sequence Nos. for Office Use:	7729-4C 8118-3B 8118-3B 8118-3B 8118-3B
Application No.:	Hei 2[1990]-115519
Application Date:	May 1, 1990
Publication Date:	January 17, 1992
No. of Claims:	7 (Total of 6 pages)
Examination Request:	Not requested

## ABSORBENT PRODUCT

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[There are no amendments to this patent]

#### Claims

1. Absorbent product with the following characteristics: in the absorbent product, to be used specifically with underwear or a diaper cover, composed of a surface sheet that is permeable to fluid, a lower sheet that is impermeable to fluid and an absorbent material that is inserted between these two sheets and equipped with pliable side flaps extending from the edges of the absorbent material to the sides and the elastic material attached to the side flaps along the area corresponding to the perineal region of the wearer, the provision is made that the first bend is made with the side flap to the inside toward the absorbent material between the edge of the absorbent material in the longitudinal direction and the inner edge of the elastic material and then the second bend is made to the outer direction toward the opposite side from the absorbent material between the first bend and the inner edge of the elastic material with the

condition that the second bend is attached to and bonded with the first bend at least in the area corresponding to the perineal region.

2. Absorbent material described in Claim 1, in which at least one of the front and back ends of the first bend in the longitudinal direction is attached to and fixed with the surface sheet.

3. Absorbent material described in Claim 2, in which the aforementioned first bend is attached and fixed at the length of 10-70 mm in the longitudinal direction.

4. Absorbent material described in one of Claims 1-3, in which the aforementioned second bend is attached and fixed with the maximum width of 10 mm from the inner edge of the elastic material to the direction of the inside of the absorbent material.

5. Absorbent material described in one of Claims 1-4, in which the aforementioned elastic material is placed from the center to the backward direction in the longitudinal orientation of the absorbent material.

6. Absorbent material described in one of Claims 1-4, in which the aforementioned elastic material is placed from the center to the forward direction in the longitudinal orientation of the absorbent material.

7. Absorbent material described in one of Claims 1-6, in which the rear surface of the aforementioned second bend is arranged to face upwards at all times.

## Detailed explanation of the invention

### Industrial application field

This invention is concerned with an absorbent material for the absorption or retention of excretions such as body fluids to be used with a diaper cover or underwear. Or in more detail, the invention is concerned with an absorbent material to be used preferably for infants and adults who are prone for incontinence or menstruation.

### Conventional technology

Conventional absorbent materials for infants and adults which is designed to accomodate incontinence and menstruation such as represented by disposable diapers, have been described in Japanese Kokai Patent Application Nos. Sho 49[1974]-93143, Sho 50[1975]-33044, Sho 50[1975]-161347, Sho 51[1976]-46245, Sho 52[1977]-84041 and Sho 52[1977]-210004. In the disposable diapers described in these patents, bends were made on both sides to form pockets, so they were called box-pleated diapers, and that modification was intended to improve the absorption, retention and sealing properties.

As other types of disposable diapers, one can cite those described in Japanese Kokai Patent Sho 58[1983]-65002, Sho 62[1987]-199802 and Sho 62[1987]-199806. These disposable diapers were characterized by placing side flaps along the longitudinal sides and forming bends on the side flaps so as to form pockets.

These modifications were intended to improve the absorption and retention of excretions and the sealing properties.

Problems to be solved by the invention

In conventional disposable diapers, there were problems inherent to the box-pleated design in that excretions absorbed in the absorbent material would leak out to soil the bed sheets, resulting in quite an unpleasant situation, because folded absorbent material was forced to fit around the leg. Since the absorbent material was folded to perform the function of sealing in these disposable diapers, the sealing mechanism was not very pliable, so it did not fit the body snugly and could not follow changes in the contours of the active body in motion.

On the other hand, in conventional disposable diapers with a folded side flap, the part comprising a pocket was so soft that the pocket would flatten or the side flap would bend inward, resulting in the loss of sealing capacity because of changes in the countours of the body in motion.

Therefore, the aim of this invention is to offer an absorbent material with the following characteristics: the form of a pocket is maintained even during activity so that absorbed excretions are retained, and the side flap is not folded inward while the initial tight seal is maintained.

Means to solve the problems

The aim of this invention was achieved by offering absorbent product with the following characteristics: in the absorbent

product, which is to be used specifically with underwear or diaper covers, comprised of a surface sheet that is permeable to fluid, the lower sheet that is impermeable to fluid and an absorbent material that is inserted between these two sheets and equipped with pliable side flaps extending from the edges of the absorbent material to the sides and the elastic material attached to the side flaps along the area corresponding to the perineal region of the wearer, the provision is made that the first bend is made with the side flap to the inside toward the absorbent material between the edge of the absorbent material in the longitudinal direction and the inner edge of the elastic material and then the second bend is made to the outside toward the opposite side from the absorbent material between the first bend and the inner edge of the elastic material with the condition that the second bend is attached to and bonded with the first bend at least in the area corresponding to the perineal region.

#### Function

In this invention, this disposable diaper is worn with underwear or a diaper cover without widening the side flaps and, then the second bend makes close contact at its flat part with the skin of the perineal region so that the absorbent material can absorb a large volume of excretions and the pocket formed by the absorbent material, the first bend and the second bend can keep excretions from leaking out.

## Application example

The invention is explained with an application example using Figures 1-5. In the application example, a disposable diaper for babies is discussed as an example of the absorbent product. Figure 1 shows a surface view of a disposable diaper at the intermediate stage of production before bends are made. A disposable diaper is shown as one application example of the absorbent product of this invention. Figure 2 shows an oblique view of the disposable diaper as a product with bends introduced to the intermediate product shown in Figure 1. Figure 3 shows a cross section along III-III in Figure 2. Figure 4 shows a cross section at IV-IV in Figure 2. Figure 5 is a partially enlarged cross section centered around the bends in the left side of Figure 3.

Disposable diaper 1, as one application example of the absorbent product of this invention, is composed, as shown in Figure 1, of fluid-permeable surface sheet 2, fluid-impermeable lower sheet 3, absorbent material 4 inserted between these two sheets 2 and 3, highly pliable side flaps 5,5 extending sideways from the absorbent material 4, and elastic material 6,6 in the form of tube to fit snugly to the perineal region placed along and beneath the side flaps 5,5. This disposable diaper is constructed to be used with underwear or diaper cover (not shown in figure).

The side flaps 5,5 are formed by fusing extensions of the surface sheet 2 and the fluid-impermeable lower sheet 3 from the both sides of the absorbent material 4. The aforementioned elastic material 6,6 is inserted between the sheets 2 and 3. The



side flaps 5,5 are folded along the entire length of the absorbent material 4 at the position between the edge of the absorbent material 4 and the inner edge of the elastic material 6,6 or along the dashed line close to the edge of the absorbent material 4 shown in Figure 1 in the direction toward the absorbent material 4 so that the first bends 51,51 formed. This folding procedure is carried out on both sides of the absorbent material. The second bends 52,52 are formed by folding the side flaps between the first bends 51,51 and the inner edge of the elastic material 6,6 or along the intermittent line near the inner edge as shown in Figure 1 toward the outside of the absorbent material 4 (Figures 2-4). As shown in Figure 5, at the second bends 52,52, the inward-facing surfaces of the side flaps are bonded with adhesive by hot melting or by ultrasonic melting to form the hardened part 8 marked with an X [sic; there is no X in Figure 5] at a certain length above the first bends 51,51. The formation of the hardened part 8 helps to maintain the following advantages: the surface sheet 2 is kept facing always upward at all times; the surface sheet [and the absorbent material] is prevented from being folded inward during the use; the hardened part 8 gives some rigidity to the second bends 52,52 so that the pockets 7,7 formed between the first and the second bends can maintain their shape. As for the width of the hardened part 8, it is preferable to be a width of 10 mm at most from the inner edge of the elastic material 6,6 toward the absorbent material. Thus, in the disposable diaper 1 of this invention with the first bend 51 and the second bend 52, the elastic material 6,6 is situated at the position next to the second bends 52,52 distant from the absorbent material with the intervening first bend. Therefore, in

the disposable diaper 1 of this invention, under unrestricted conditions, the elastic material 6,6 contracts at the second bends 52,52 so as to bend the diaper into a convex shape inward and to the side of the surface sheet, forming gathers, and to let the first bends 51,51 open up, resulting in the formation of pockets 7,7 between the two edges of the absorbent material 4 and the first bends 51,51 (Figures 2 and 3).

The elastic material 6,6 placed along the second bends 52,52 is inserted into the diaper longitudinally from the longitudinal center of the second bends 52,52 toward the rear. Therefore, gathers are formed in a plane on the second bend at each point from the center to the rear so that the inside of the diaper is tightly sealed along the perineal region of the wearer. For a disposable diaper 1 for adult use or for use in the event of incontinence, the elastic material 6,6 is placed along the second bends 52,52 from the longitudinal center of the second bend toward the front.

On the other hand, the first bends 51,51 are bonded to the surface sheet 2 with a certain length to form the hardened part 9 at least at one longitudinal end so as to prevent, together with the second bends 52,52, the contents of the diaper from spreading outward. The length of the aforementioned hardened part 9 is preferably 10-70 mm from a functional standpoint. In the disposable diaper 1 of this invention, the back ends are hardened.

In the disposable diaper 1 of this invention, publicly known materials can be used for the surface sheet 2, the lower sheet 3, the absorbent material 4 and the elastic material 6.

The disposable diaper 1 of this invention, in which the

folded structure is maintained with the first bends 51,51 and the second bends 52,52, can be put on [the baby] easily and quickly. Once the diaper is in place, the second bends 52,52 makes contact with the skin of the perineal region, and pockets 7,7 are formed on both sides of the absorbent material 4 so that the absorbent material 4 will absorb easily absorbable excretions, and, at the same time, excretions that are difficult to absorb, such as feces, are trapped in the pockets 7,7 with the assured prevention of leakage of excretions. Since sufficiently large side flaps are installed with respect to absorbed volume in the disposable diaper 1 of this invention, an extremely large amount of excretions can be accommodated in the pockets 7,7.

Since the elastic material 6,6 is installed far from the absorbent material 4 in the disposable diaper 1 of this invention, the elastic force is not transmitted from the elastic material to the absorbent material 4, resulting in the absorbent material being free from distortion and weakening as well as being excellent in terms of leakage prevention.

This invention is by no means limited by the example of the disposable diaper used for explanation. This invention can be used for menstruation [sic; feminine hygiene products] as long as the principle of the invention is not violated.

We carried out a wetting test and others as described below using the specific example of a disposable diaper to examine the prevention of wetting.

## Test examples

### (A) Wetting test

The wetting test was carried out as described below using the disposable diaper of this invention.

#### Test Example 1

Product 1 of this invention shown in Figures 2-5 was produced using the material under the conditions described below.

Product 1 of this invention was used in the wetting test as described below, and the result is shown in Table I.

##### (1) Material and dimensions

Top sheet 2: Nonwoven polypropylene fabric with the dimensions of 30 cm x 20 cm

Back sheet 3: Polyethylene film, 30 cm x 20 cm

Absorbent material 4: Complex of fluffed pulp and highly absorptive polymer, 25 cm x 12 cm

Elastic material 6: 8 mm wide

(2) Height of the first bend 51 shown in Figure 5: H = 15 mm

(3) Width of the second bend 52 shown in Figure 5: W = 15 mm

(4) Width of hardened part 8 of the first bend 51 and the second bend 52 shown in Figure 5: W = 5 mm

(5) No hardening at the both ends in the longitudinal direction at the first bend 51

## Wetting test

In this test, the product of the invention was applied together with a diaper cover to a baby model (corresponding to 2 month-old) in which the legs can be opened and, while the model was lying in the supine position, artificial feces described below were expelled from a tube at the speed of 4 g/sec until leakage was observed so as to measure the absorptive capacity of the absorbent material 4.

"Artificial feces": a suspension of 3 wt% bentonite with the viscosity, adjusted with carboxyethylcellulose of 10 cp.

### Test Example 2

Product 2 was prepared similar to product 1 except the first bends 51,51 were hardened at both ends in the longitudinal direction at the length of 50 mm. The aforementioned wetting test was carried out with product 2, and the result is described in Table I.

### Test Example 3

Product 3 was prepared similar to Product 2, except that the second bends 52,52 were bonded at the width of 2 mm to the first bends 51,51. The aforementioned wetting test was carried out with the product 3, and the result is shown in Table I.

Comparative Test Example 1

Comparative product 1 was prepared without the first bends 51,51 and the second bends 52,52, and a wetting test was carried out with this product for comparative purpose. The result is shown in Table I.

Comparative Test Example 2

In this test, the first bends 51,51 and the second bends 52,52 were formed but we constructed the comparative product 2 without hardening the two areas. The aforementioned wetting test was carried out with Comparative Product 2. The result is shown in Table I.

Table I. Wetting with baby model

	Amount absorbed until leakage occurred
Product of this invention 1	35
Product of this invention 2	45
Product of this invention 3	55
Comparative product 1	15
Comparative product 2	20

## (B) Adhesion Test

In this test, a disposable diaper was worn by the aforementioned baby model, and the motion of opening the legs was repeated 50 times to determine the condition of creeping-in at the second bends 52,52 in the side flaps 5,5 to evaluate adhesion.

In this test, we examined the presence or absence of creeping-in using product 3 of this invention and comparative product 1 independently. Creeping-in was determined to be present if there was even a slight creeping of the second bends 52,52 to

the inside. In this test, a disposable diaper was used for each test, and the test was carried out with a total of 120 disposable diapers (120 times), and the number of cases with creeping-in was expressed as a percentage.

The rate of creeping-in was 0% with product 3 of this invention and 46% with comparative product 1.

(C) Test for ease of changing [the diaper]

In this test, ease or difficulty was evaluated by measuring the time required to put the disposable diaper and a diaper cover on the baby model. In this test, each disposable diaper was used once, and the test was repeated 100 times using 100 disposable diapers. The average time was calculated from the results of 100 tests.

With product 3 of this invention, the time required was 15.5 sec but with comparative product 1, the time was 23.0 sec.

With the results of tests (A), (B) and (C), the product of this invention was superior to the comparative product with respect to the prevention of leakage, sealing property and ease of changing.

Effects of this invention

In the absorbent product of this invention, side flaps with elastic material are folded into the side of the absorbent material between the edge along the side edge of the absorbent material and the inner edge of the elastic material in order to form the first bend, and then the second bend is formed by



folding the side flap between the first bend and the inner edge of the elastic material. The second bend is hardened by bonding it with the first bend at least in the area corresponding to the perineal region of the wearer so that the shape of a pocket is maintained while the product is worn. As the result, excellent absorption and retention of excretions are achieved, while no creeping-in is induced for the side flap in the inward direction, so that the initial sealing condition is maintained with excellent adhesion at this part.

#### Brief explanation of the figures

Figure 1 shows the surface view of the intermediate product of a disposable diaper as one of application example of the absorbent product of this invention, before the bends are formed. Figure 2 shows the disposable diaper viewed obliquely, showing the bends introduced to the intermediate product shown in Figure 1. Figure 3 shows the cross section of the product along III-III in Figure 2. Figure 4 shows the cross section of the product along IV-IV in Figure 2. Figure V shows a partially enlarged cross section centered around the bends on the left side in Figure 3.

- 1: disposable diaper (absorbent product)
- 2: surface sheet
- 3: underlayer
- 4: absorbent material
- 5: side flap
- 6: elastic material

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51:  first bend
52:  second bend
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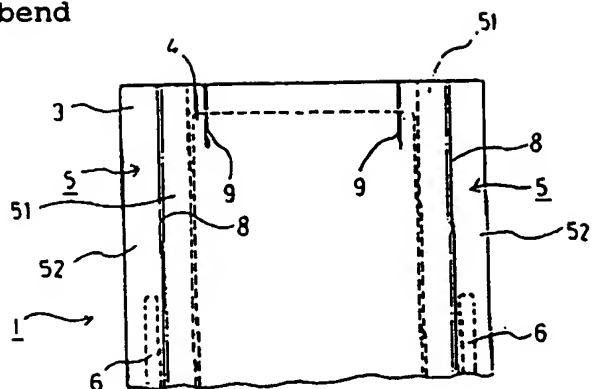


Figure 1.

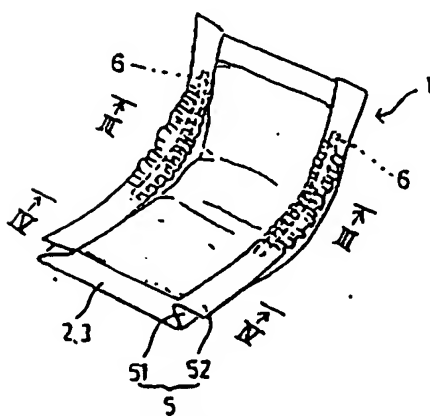


Figure 2.



Figure 3.

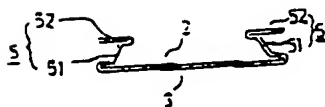


Figure 4.

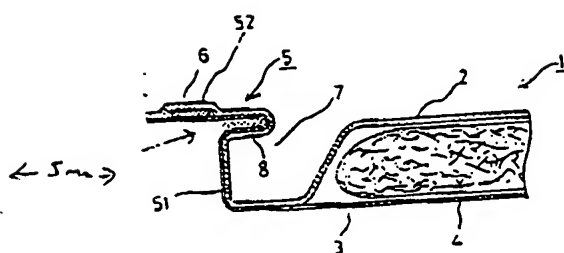


Figure 5.